Examiners' Report
Lead Examiner Feedback

June 2022

Pearson BTEC Nationals
In Aplied Science (31629H)
Unit 7: Contemporary issues in Science

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Grade Boundaries

What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, at Distinction, Merit and Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark is for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each assessment, because then it would not take accessibility into account.

Grade boundaries for this, and all other papers, are on the website via this link

Awarding BTEC qualifications in 2022

Ofqual has set out their plans for awarding qualifications in 2022 and intend to return to a normal, pre-pandemic, approach to grading standards over by 2023. They have confirmed that 2022 will be a transition year, to reflect that we are in a pandemic recovery period and students' education has been disrupted.

Our guiding principle and approach to awarding BTEC qualification results in 2022 will be to ensure parity in relation to the approach being taken for GCSE and A level learners. BTEC courses have a different structure and design to academic qualifications - BTECs are modular qualifications (with assessments taking place throughout the course) compared to GCSEs and A levels which

are linear (assessed and awarded at the same time at the end of the year), and therefore our approach needs to be different.

In 2022 we will return to the usual method of calculating BTEC qualification results, however adaptations including, U-TAGs and reduced internal assessment, are in place to provide a comprehensive package of support for students.

The basis of our awarding approach to BTECs this year is to ensure it is as fair as possible for all learners. We will use a range of evidence to set grade boundaries for the external units. Part of this evidence will be to closely monitor learner performance in all assessments that contribute to learners' final qualification grade, to ensure parity with A level and GCSEs.

Further information can be found on our website and via our Social Media channels.

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Introduction

Unit 7, Contemporary Issues in Science (31629H), enables learners to develop their skills at understanding and evaluating various contemporary issues in science, how the issues impact upon the world in which we live and how they are reported and discussed in academic and non-academic articles.

The assessment outcomes are:

AO1 Demonstrate knowledge and understanding of the issue
AO2 Apply knowledge and understanding of the issue to real life scientific scenarios
AO3 Be able to interpret, analyse and evaluate sources of scientific information and make suitable judgements
AO4 Synthesise ideas from several sources

This was the seventh series of examining this specification. Issues for previous series were antibiotic resistance, nanotechnology in space travel, genetically modified crops, health effects of diesel, plastic pollution, and wave and tidal power.
This session's issue was stem cell therapy.

The question paper followed the same format as for the previous six series, which is the same as that given in the sample assessment material. It consisted of five questions requiring open responses. Two carry 12 marks, one has 6 marks, one has 5 and the final question carries 15 marks. The final question varies in its format – it may ask learners to write a report or an article for a type of magazine and learners should consider the intended audience and write their response to this question accordingly.

Learners are given access to the three information sources before the exam and should have a total of six hours to analyse the content and, should they wish to carry out any further research on the topic.

Learners should be looking at the ethical, social, economic and environmental impacts of the issue as well as areas of the issue that need to be further developed or researched, plus the potential advantages, disadvantages and risks associated with the issue.

Introduction to the Overall Performance of the Unit

The issue for this series was stem cell therapy. The three articles were interesting and accessible to learners. In general, the quality of answers was good with many learners demonstrating good understanding of the science behind the topic. Many had also carried out competent research in preparation for the exam and wrote well-thought out and intelligent responses. It appears that many learners had been well prepared for this exam.

Many learners also demonstrated that they were thinking critically about the issue and their responses showed an interest in the material of the articles.

In a few cases, however, the responses of some learners indicated that they had not fully read the articles or prepared themselves adequately for the exam. Some learners also tried to apply the style for answering Q1 to their responses to all of the questions and referred to ethical, economic and social impacts for the responses to other questions, which was not appropriate. In some cases it was difficult to distinguish between a learner's response to Q5 and their response to Q1. Some forgot about audience awareness for Q5 and their article morphed into an essay, again trying to link to economic, ethical and social impacts.

Unfortunately, some centres appear to be encouraging their learners to generate grids for answering the questions – along the lines of those given as guidance for examiners, in the mark scheme. Unfortunately, some learners simply copy the information from their grids, taken in as their notes, and therefore penalise themselves as they cannot gain marks for fluency, coherence and logical structure or synthesis of ideas, as would be judged in a prose response, which is what they should be writing. If learners use this approach, particularly for Q1 or Q3, they cannot demonstrate a clear, coherent and well structured discussion in their responses, for which there are marks available but they cannot access those marks.

Some learners are not managing their time well and spend far too long on Q1 and, in some cases, also on Q2, and then do not have enough time for answering some of the other questions. If they do not have time for Q5, they are in danger of losing a good number of marks.

Some learners do not appear to appreciate the need for paragraphs when they stucture their response and for those who use word processors, the spell check option should be enabled.

More detailed comments on each question are given below.

Individual Questions

Q1

In this question learners were asked to discuss the implications of the scientific issue: stem cell therapy.

As indicated in the specification, learners should discuss the ethical, social, economic and environmental impacts of the development and use of stem cell therapy.

Overall, this was the best answered question of the paper.

Good responses showed that learners were able to select relevant information from the three articles and weave it into a coherent and logical discussion whilst demonstrating the ethical, social and economic implications. There really were no environmental impacts and some good responses said just that but some learners tried to make an environmental link; in most cases this was an extremely tenuous link and sometimes quite bizarre – for example that there would be so many lives prolonged by stem cell therapy that the world would become hugely overpopulated, or that the petri dishes used would cause a mountain of plastic waste.

Some learners discussed each article in turn which is not really what is required as it does not allow them to demonstrate the ability to synthesise relevant information into a fluent and coherent account. Some learners used side headings and dealt with the content they had selected on an implication by implication basis; again this approach prevents learners from demonstrating the AO3 and AO4 assessment outcomes and from scoring the higher band marks.
Many learners realised that the ethical implications were key here as one source of stem cells is from spare embryos created during IVF treatments. However, some latched on to the reference in Article 1 to an early criticism of scientists playing God, after the cloning of Dolly the

Sheep, and wrote at length about 'playing God'. Some responses implied that Dolly herself had been playing God. Some learners were also rather confused about the significance of Dolly and missed the point that she was the first mammal cloned from an adult, differentiated cell (fused with an enucleated egg cell). This inspired Yamanaka to later develop the technique of reprogramming differentiated cells, by adding four transcription factors to switch back on four specific genes, to turn these cells back into stem cells – induced pluripotent stem cells. This largely eliminated the need to use embryonic stem cells – thus avoiding an ethical dilemma. Many quoted that he had won the Nobel Prize but fewer seemed aware of why he had won that prize.

Many learners selected the relevant ethical and economic implication that there are many unregistered and unregulated private clinics giving people false hope and using treatments that have not been fully trialled and tested. Some commented on the economic implications with regard to the funding needed for research and development and to the investment potential for new treatments.

Many learners appreciated that stem cell therapy could cure chronic, at present untreatable illnesses such as Parkinson's and Alzheimer's diseases and that chronic, non-communicable diseases are the leading cause of illness in many countries today. However, some misinterpreted the information they had read and talked incorrectly of stem cell therapy being used for infectious diseases. Some also misinterpreted information and thought that IVF was specifically for the purpose of obtaining stem cells and that, as such, babies were being murdered in the process.

Some learners misinterpreted information in the articles and thought that embryonic stem cells were reprogrammed to become induced pluripotent cells or that genes, rather than transcription factors, were added to cells to reprogram them. Learners should use their preparation time to read the articles more than once and make sure they have fully understood their content.

The following response achieved Band 4 with 10 marks

1 Discuss the implications of the scientific issue identified in the articles.

(12)

The first issue is that getting cells from the process of IVF has ethical ~~issues~~ concerns; "obtaining them requires destruction of human embryos, obtained from spare embryos created during IVF treatment" so there are concerns ~~with~~ of killing or destroying cells that could have been embryos aswell as getting cells from a human which could cause discomfort. "Embryonic catemacs cells used in research are donated by couples who have undergone in vitro fertilisation treatment. They choose to donate spare embryos that would otherwise be destroyed so that stem cells can be extracted for use in research. Only embryo is at a very early stage of development (up to 14 days) can be used. This means cells must be extracted quick fast after the treatment which could cause distress. However on the other hand, if the cells are going to die anyway,

some individuals may see it as now they're being used for good, for research and to help others. The discovery of IPSC overcame this ethical concern. However IPSC's also have concerns for their "unlimited capacity of differentiation with concerns that these cells could one day be used for human cloning. Lastly, article 1 says "Many of the advances in stem cell research have only been possible through the knowledge and insight gained using embryonic stem cells" so we wouldn't be anywhere in research without getting cells from IVF treatment. We wouldn't have such successful stem cell therapies helping with diseases like Alzheimers and Parkinsons which have changed peoples lives.

The second issue is that individuals have undergone trials to test stem cell therapies which is a huge risk because people dont know what could happen to them." The use of IPSC's in therapy is still considered a high risk treatment,

Since transplant anon of these cells could induce tumour (cancer) formation" - a huge risk for people undergoing trials. Protocols are being developed to ensure the safety in addition to developing global clinical-grade PSC cell lines before these cells are available for clinical use. People undergoing trials of their skin cells being tested in a dish can help create new drugs. Instead of testing 1,000 drugs on a human, we can do it on their skin and "replicate these things to see if the drugs work in a dish" so this makes the process safer, no drugs are touching the individuals cells still in their body so they aren't at harm. Stem cell therapies and trials have got good feedback; a gamer replied to them to thank them for their work they're doing in this area and the scientists said "this is why we're doing it". In the past few years, we have witnessed an exponential increase in clinical trials revolving around stem-cell based therapies; some of these trials resulted in remarkable impact on various diseases

A huge ethical issue is the increasing number of clinics offering unproven stem-cell based treatments - "there are many untrustworthy clinics offering expensive stem cell treatments and some patients have experienced horrifying complications". Most of the complications will never be able to be fixed and this could be life threatening. It's a new, still developing area. In total, 1.4 billion has been invested in regenerative companies in 2019. We can't mend dead cells but with ongoing research we may be able to find out just that. No unproven clinics should be providing that service without being examined too.

Lead Examiner comment: *The learner has selected relevant information and discussed the implications. The discussion is well structured and clear and can be followed. There is a heavy emphasis on ethical concerns but there is good understanding and some social implications such as the risk of cancer from this treatment. This was placed at the bottom of Band 4 with 10 marks. Had the learner also said a little about economic implications it would have reached the top of Band 4 with full marks.*

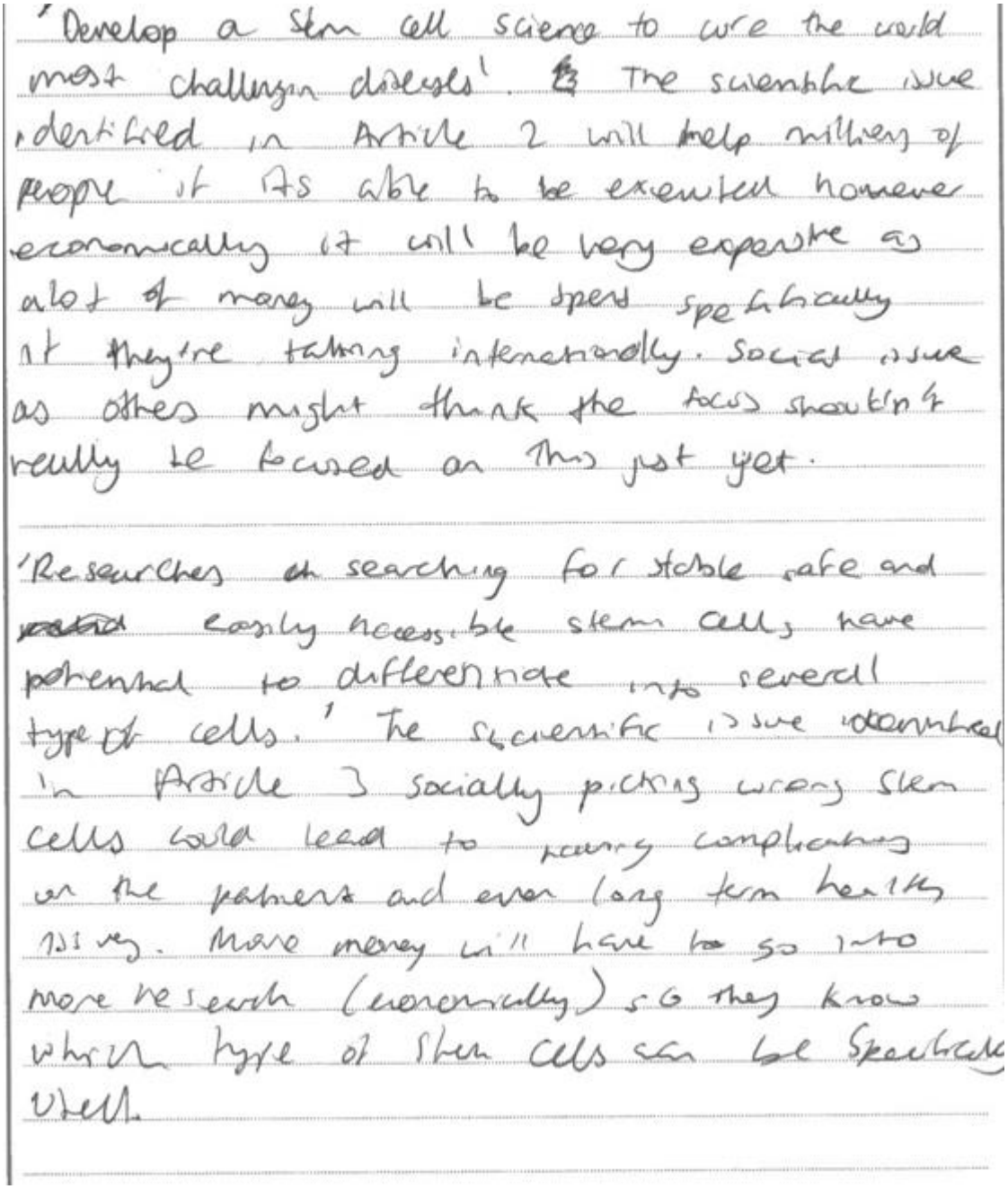
The following response achieved Band 1 with 3 marks

1 Discuss the implications of the scientific issue identified in the articles.

(12)

' To explore how we can kickstart heart cells to regenaTate or repair heart muscles following a heart attack'. The scientific issue identified ~~with~~ in article 1 ~~mai~~ is a economic issue because this issue will need alot of money needed on research and this can lea to a social implication as because alot of money is getting used to explore how they can kick start ~~ou~~ cells they'll be outburst as the money can be used in a much more important field.

Economic issue again with the fact that procedure will intake 'delivering drug like molecules into body'. Furthermore to the social issue it can have side effects to the individuals as ~~there~~ there's always a disadvantage to any type of drug especially if its not new.



'Develop a stem cell science to cure the world most challenging diseases'. The scientific issue identified in Article 2 will help millions of people if its able to be executed however economically it will be very expensive as alot of money will be spent specifically if they're taking internationally. Social issue as others might think the focus shouldn't really be focused on this just yet.

'Researches on searching for stable safe and easily accessible stem cells, have potential to differentiate into several type of cells.' The scientific issue identified in Article 3 socially picking wrong stem cells could lead to many complications on the patients and even long term health issues. More money will have to go into more research (economically) so they know which type of stem cells can be specifically used.

Lead Examiner comment: *The learner has pulled out and quoted a few lines from the articles but has not shown any appreciation of the significance, if any, of these quotes. The references to cost, social implications and ethics are vague and limited. The response demonstrates limited knowledge and understanding, and the discussion is not well structured.*

The following response achieved top of Band 2 with 6 marks

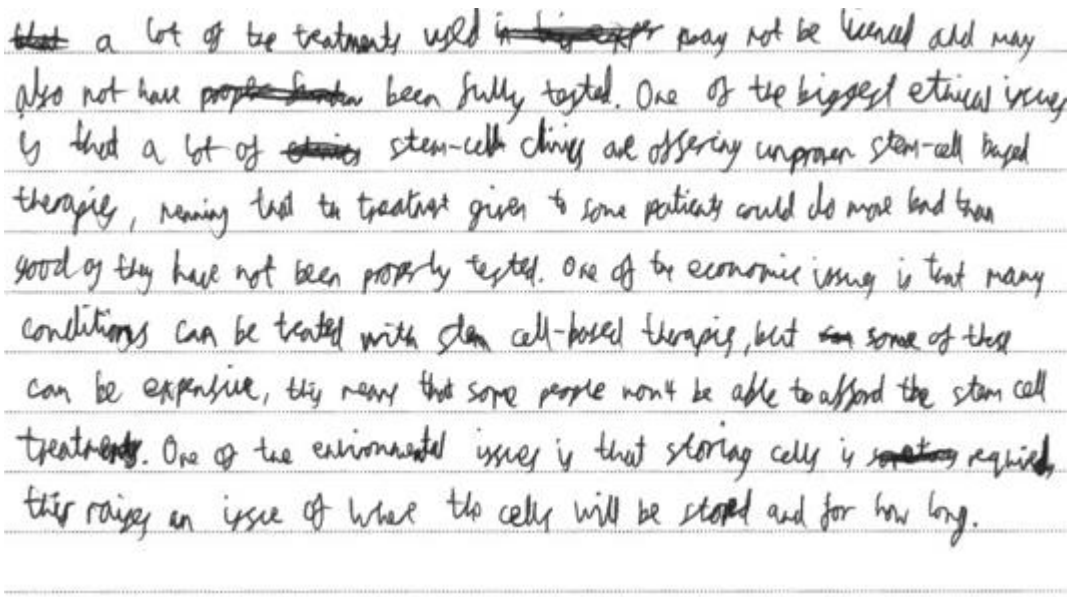
1 Discuss the implications of the scientific issue identified in the articles.

(12)

One of the many ethical issues ~~write~~ mentioned in article 1 is the fact that spare IVF embryos are used in ~~the~~ stem cell research as they have ~~multiple~~ many stem cells. One of the social issues mentioned in article 1 is that research can only be done when ~~someone~~ that is an application to a ethics panel and a licence from the Human Fertilisation and Embryology Autority ~~(HFEA)~~ (HFEA). One of the economic issues is that funding has to be obtained. There doesn't seem to be many environmental issues mentioned in article 1, which state how stem cell research could repair heart attack damage.

Article 2 mentions how stem cells could be the medical innovation of the century. ~~Article~~ One of the few ethical issues mentioned is that the regenerative medicine obtained from stem cells is sometimes extracted from embryos, ~~as mentioned in article 1~~, however this medicine can regrow, repair or even replaced damaged organs and tissues. One of the large economic issues is that funding is being given by investors and large companies and if these stop funding, then a lot of research ~~will~~ will be lost. A big social issue is that the demand for stem cell-based treatment and therapies is increasing very quick, meaning that a lot of treatments will be low in quantity, suggesting that not ~~all~~ everybody will be able to get these treatments. A big environmental problem is that the older the stem cells, the less effective they are and this means that not all the treatments will be as effective on different people, depending how old the stem cells used in the treatment are.

Article 3 is an overview of the current state of stem cell-based ~~research~~ therapies. One of the social issues that is pointed out is that many clinics are doing clinical trials without acquiring all the needed approvals, this means that


a lot of the treatments used may not be licensed and may also not have been fully tested. One of the biggest ethical issues is that a lot of stem-cell clinics are offering unproven stem-cell based therapies, meaning that the treatment given to some patients could do more bad than good as they have not been properly tested. One of the economic issues is that many conditions can be treated with stem cell-based therapies, but some of these can be expensive, this means that some people won't be able to afford the stem cell treatments. One of the environmental issues is that storing cells is required, this raises an issue of where the cells will be stored and for how long.

Lead Examiner comment: *The response shows adequate knowledge and understanding, has made some links to the implications and is coherent.*

The following response achieved Band 3 with 8 marks

1 Discuss the implications of the scientific issue identified in the articles.

(12)

These three articles are about stem cells, stem cells are undifferentiated cells which can develop into many different types of cell types. The fact that they are undifferentiated means that they are not yet specilized for any purpose.

The articles that are provided all discuss the the scientific issues regarding stem cells, the articles are from websites and there are several issues that are raised in these articles which include social, ethical, economical and enviromental impacts.

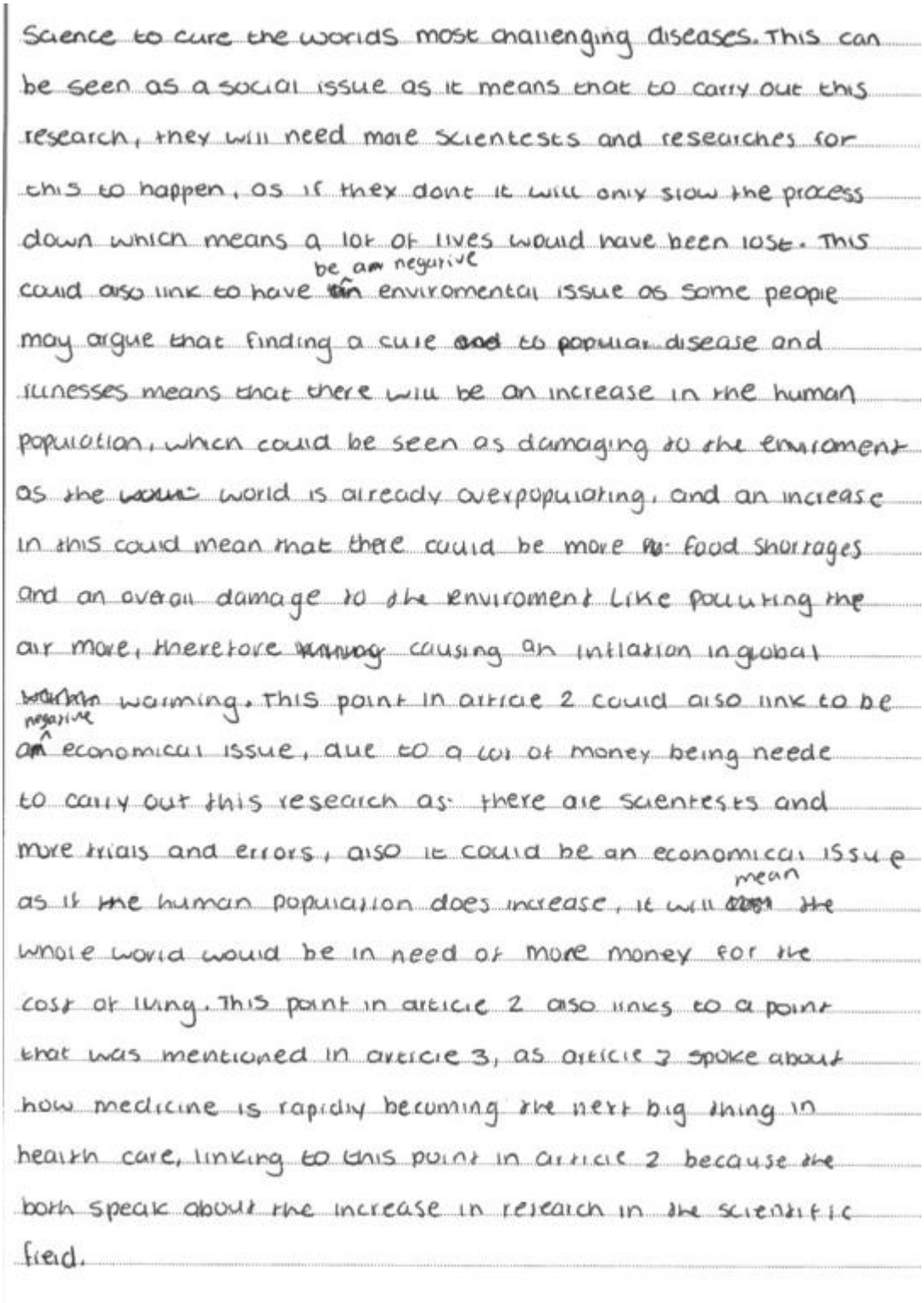
In Article 1, an ethical issue is raised as when dollys creation was made using stem cells scientests were being accused of playing god. This shows to be a negative issue that was raised as some people may believe that a living thing should be made naturally since they believe that god is the only person to create beings rather than them being man made and be created purly on by Science. However opposing people argue this point as some people don't believe in god and just believe in science and that science is greater. This point could also link to have an economical issue, and as to create and clone a living thing takes expensive resources due to trial and error, it is also expensive to gather the research from and scientests for this kind of project meaning a lot of funding must be gone into this whole process and the people who do believe that carrying

out a project like this is wrong may think that its a waste of money and a waste of resources.

Also in article 1 another scientific issue showed to be raised which also showed to be an enical problem as it was explained that until recently, stem cell research scientests needed to obtain human embryotoic stem cells from spare IVF embryos with the premission of the donors and these embrynic cells could then be stimulated into becoming any type of human body cell. This can be seen as an ethically negative issue as some people believe that its morally wrong to use embryos for research as these are potentially living beings and some people may even say its close to argue. However you could argue that using them for research is a good thing as they are being used to save peoples lives that are suffering due to an illness or a disease. This could link to being a social issue as women are the only ones that are able to produce an embryos. So ~~they may~~ it may be hard to obtain them. A similar issue was also spoken about in article 3, as ~~it also~~ as it spoke about ESCs and how obtaining them involve destruction of human embryos making them unacceptabe for a lot of the population. Showing how this issue in article 1 ~~also~~ also links to an issue that was spoken about in article 3.

In article 2, a social issue is raised as it explained how if they have greater resources and an increasingly large/experienced talent pool then scientests may be able to develop stem cell

In article 3, a social issue is raised as it was said that stem cells have helped treat patients and have been successful with some spinal cord injuries and have approved of this type of therapy and IPSCs were shown to be successful in the eye disease because 2 trials have happened and they both showed to be successful. this shows to have a positive social impact as it explains how patients are approved of the therapy and it had been successful, meaning the word of this will spread and more people will try this, and a lot of lives will be saved. this could also link to be an ethical issue, but a positive one as the trials show that the procedures work and are safe so the patients would then feel safe as there is proof that it has been done before and has come out to be successful, therefore easing the mind of the patients. This also links to a point in article 2 as it talks about how the patients needs are immediate, meaning some patients are eager to undergo stem cell therapy.



science to cure the worlds most challenging diseases. This can be seen as a social issue as it means that to carry out this research, they will need more scientests and researches for this to happen, as if they dont it will only slow the process down which means a lot of lives would have been lost. This could also link to have be an negative environmental issue as some people may argue that finding a cure ~~and~~ to popular disease and illnesses means that there will be an increase in the human population, which could be seen as damaging to the enviroment as the ~~world~~ world is already overpopulating, and an increase in this could mean that there could be more ~~to~~ food shortages and an overall damage to the enviroment like polluting the air more, therefore ~~causing~~ causing an inflation in global ~~warming~~ warming. This point in article 2 could also link to be negative an economical issue, due to a lot of money being neede to carry out this research as there are scientests and more trials and errors, also it could be an economical issue as if the human population does increase, it will mean the whole world would be in need of more money for the cost of living. This point in article 2 also links to a point that was mentioned in article 3, as article 3 spoke about how medicine is rapidly becoming the next big thing in health care, linking to this point in article 2 because the both speak about the increase in research in the scientific field.

Lead Examiner comment: *The response deals with the question on an article by article basis and is not very well integrated or synthesised but demonstrates quite good knowledge and understanding and the account can be easily followed.*

Q2

Many responses to this question gave a fairly long list of key scientists and/or organisations but failed to say how they influence the issue. It is possible to deduce their influence from the articles, but many learners researched them, which is fine, but they must make sure they are looking at the right reference. In some cases, one of the scientists had a name the same as a registered sex offender and some learners wrote about the scientist as if he was also the latter. A potted biography of the scientists with a list of their accolades followed by 'so he has a huge influence' is not really a sufficient response. Yamanaka would have been an obvious choice as his contribution by developing induced pluripotent stem cells meant that embryonic stem cells do not have to be used – hence removing an ethical concern, and by taking cells from the patient and reprogramming them the issue of rejection is resolved.

The following response achieved top of Band 3 with 6 marks

2 Identify the different organisations/individuals mentioned in the articles and suggest how they may have an influence on the scientific issue.

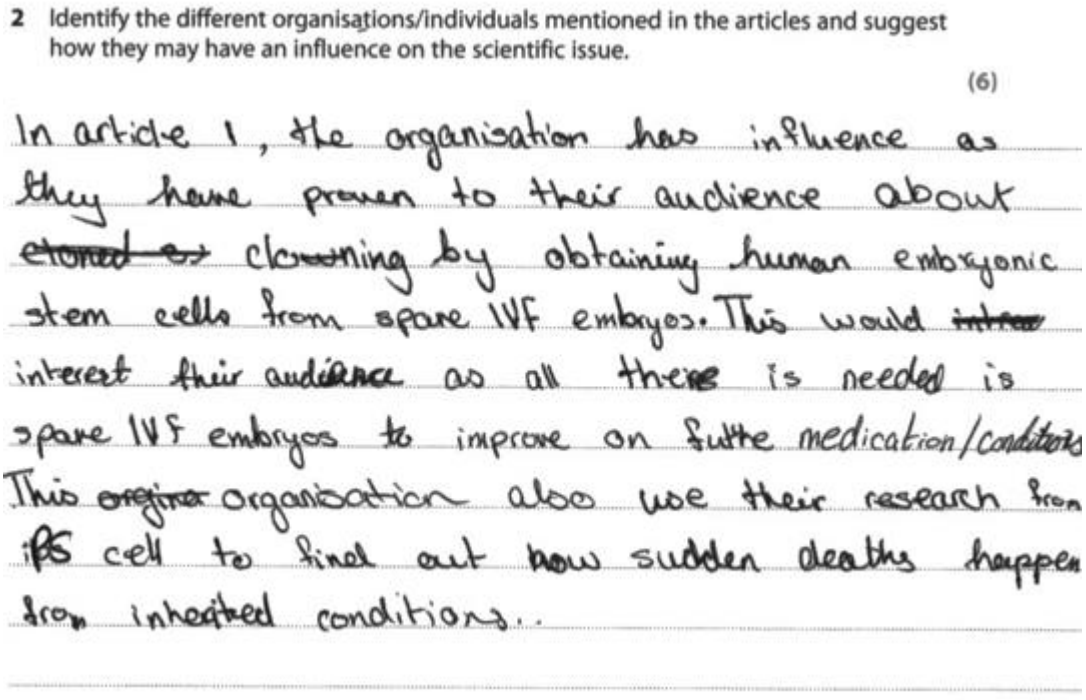
(6)

Shinya Yamanaka is a key individual in the development of stem cells, and is mentioned throughout all the three articles. He is a Japanese stem cell researcher. Until recently, to do stem cell research, Scientists needed to obtain human embryonic stem cells from spare IVF embryos. These created ethical issues which made the public against them. But thanks to Yamanaka, we now have IPS cells which have changed how things are done. It grants scientists freedom as they are no longer limited by what the human body will allow. His work was a great success and so just six years later after presenting the IPS cells, Yamanaka won a Nobel Prize. An organisation to influence the development is Celgene, mentioned in article 3. Celgene is a pharmaceutical company that makes cancer and immunology drugs. On their website, they post clinical study report synopses as a way of being transparent and improving scientific and medical knowledge and promoting innovative

treatment approaches. ~~The research can be worked on their further by others.~~
Celgene carried out ~~an~~ a trial in 2014 using adult stem cells to treat patients suffering from multiple sclerosis (MS). Results showed the treatment was safe but did not improve the MS conditions. Data from this trial can be used to develop research on MS treatments.
New York State Stem Cell Science Programme (NYStem), from article 2, ~~is~~ works to further the agenda of the Empire State Stem Cell Board, whose mission is to foster a strong stem cell research community in ~~&~~ NY. and accelerate the growth of scientific knowledge about stem cells. NYSTEM helped fund stem cell research. With more money going into the sector, research can happen quicker and with better technology.

Lead Examiner comment: *The response is clear, and relevant. It clearly shows how one individual and two organisations influence the issue.*

The following response achieved Band 1 with 1 mark



2 Identify the different organisations/individuals mentioned in the articles and suggest how they may have an influence on the scientific issue.

(6)

In article 1, the organisation has influence as they have proven to their audience about ~~cloned s~~ clowning by obtaining human embryonic stem cells from spare IVF embryos. This would ~~intrest~~ interest their audience as all there is needed is spare IVF embryos to improve on futhe medication/conditions This ~~orginal~~ organisation also use their research from ips cell to find out how sudden deaths happen from inherited conditions..

Lead Examiner comment: *The response shows little or no understanding of what the question is asking and it is not clear which organisation the learner is referring to.*

The following response achieved Band 2 with 3 marks

2 Identify the different organisations/individuals mentioned in the articles and suggest how they may have an influence on the scientific issue.

(6)

Article 1 has the most mentioned individuals and organisations, it is written by the British Heart Foundation (BHF) which is an extremely well known globally foundation despite it being British because of it's work, money raised and how long the foundation has existed. Because Article 1 is written by BHF it will be very trusted socially by people who read it as their work has been very positive. The article also contains a quote by the BHF professor, Michael Schnieder about the science behind the 'patient in a dish', Michael has been professor of BHF for many years which means they trust his opinions. Article 1 also repeatedly mentions the professor of stem Biology at the Nottingham University, Chriss Denning, who has been involved for over a decade so his involvment has influenced the research and knowledgment extremley which is why the BHF mentions him within this article. Also Article 1 inclueds the Nobel Prize and the winners, Shinya Yamanka and John Gurdon, the Nobel Prize is a globel aknowledgment of individuals

which have made a big impact globally so they influenced the science extremley. Article 2 was published by the world economic forum and containes many money figures and statistics however it shows no mention of which companies the billions of pounds were invested in which keeps people in the dark about what their government is spending money on, this has the potential to raise many economic issues as people won't agree on gatekeeping where the money has gone when there are other issues in the world that should be addressed aswell. Article 3 was published by the National Center for Biotechnology Information which makes this a reliable source as the organisation's purpose is to release information. Article 3 also mentioons the breakthrough of embryonic stem cells and their breakthrough found by Shinya Yamanka, her influence has created the ethical problems surrounding embryonic stem cells.

Lead Examiner comment: *The response gives a fairly comprehensive list but is not specific about how each exerts an influence.*

Q3

This question asks learners to discuss whether Article 3 has made valid judgements about the scientific issue. This is the question that was the least well answered. Many learners restricted their answers to general comments about references, peer review, reliability of the source(s) of the article and the authenticity of the data. Some learners consider all three articles and try to relate what they are saying to the economic, social and ethical implications, which is not relevant in this question, although it is relevant to cite evidence in the other articles that supports or does not support the conclusions made in Article 3.

Some responses appeared not to be planned and, in some cases, the poor synthesis and use of language made it difficult to follow the lines of argument. A key failing is that many learners do not identify exactly what conclusions and judgements have been drawn. However, some learners correctly identify some of the judgements and conclusions and then address them in terms of quality of data to support them or to the style of writing of the article.

Better responses comment on the research carried out and whether other studies support or refute the conclusions and include evidence to back up their statements.

Learners who went beyond generic statements and provided specific examples were able to achieve Band 3 or Band 4. There were plenty of points that learners could have discussed to give positives and negatives about the validity and reliability of the article, but many learners appear not to know which factors to talk about. Those who gained high marks referred to sample size, repeatability of trials, bias, author expertise, peer review and supporting evidence.

The following response achieved Band 4 with 12 marks

3 Discuss whether Article 3 has made valid judgements.

In your answer you should consider:

- how the article has interpreted and analysed the scientific information to support the conclusions/judgements being made
- the validity and reliability of the data
- references to other sources of information.

(12)

Artical 3 has talked about the potential of stem cell therapy and how it can be used to treat many ailements and diseases in todays world.

Reliability = the extent to which the results can be reproduced when the research is repeated under the same conditions. Artical 3 was written by Riham Mohamed Ahmy who at the time of writing the artical worked in the dental industry. He studied at the Ain Shams university in ~~egypt~~ Egypt and is not a stem cell specilist meaning the entirity of his work was research based. Riham does not have any other articals publically to his name making this articals reliability a bit weak. However, this artical was posted on the National Centre for Biotechnology Information in 2020. This website is part of the US national Library of ~~&~~ medicine and is approved and funded by the US government. The website also has a strict policy if you want to upload an artical. This policy includes the artical to have

been "posted for minimum 12 months", must be peer reviewed within 12" before it can be posted and "must contain a minimum at 40 peer reviewed articals in it and referenced." furthermore, the NCBI houses a series of data base relevent to biotechnology and is an important ressource for bioinformatics tools and services. All of these factors contribute to the reliability of the artical. further more, the artical contains 62 references, all related and written by people in the Stem cell field however, 58 of them are from the PubMed website and the other 4 are from google scholar. All pubmed referenced are peer reviewed however there is not a wider range of sources** In addition, it was stated that for this exam the artical had been meaning valuble information might be missing making it less reliable and contributing to possible bias. The artical has been peer reviewed by several people and was allowed onto the website. furthermore, Riham would not have been paid for it to be put onto the website so all he has to gain is validation.

** Pubmed is a search engine accessing mostly the MEDLINE for sciences and biomedical topics. All information on here is cross referenced and peer reviewed.

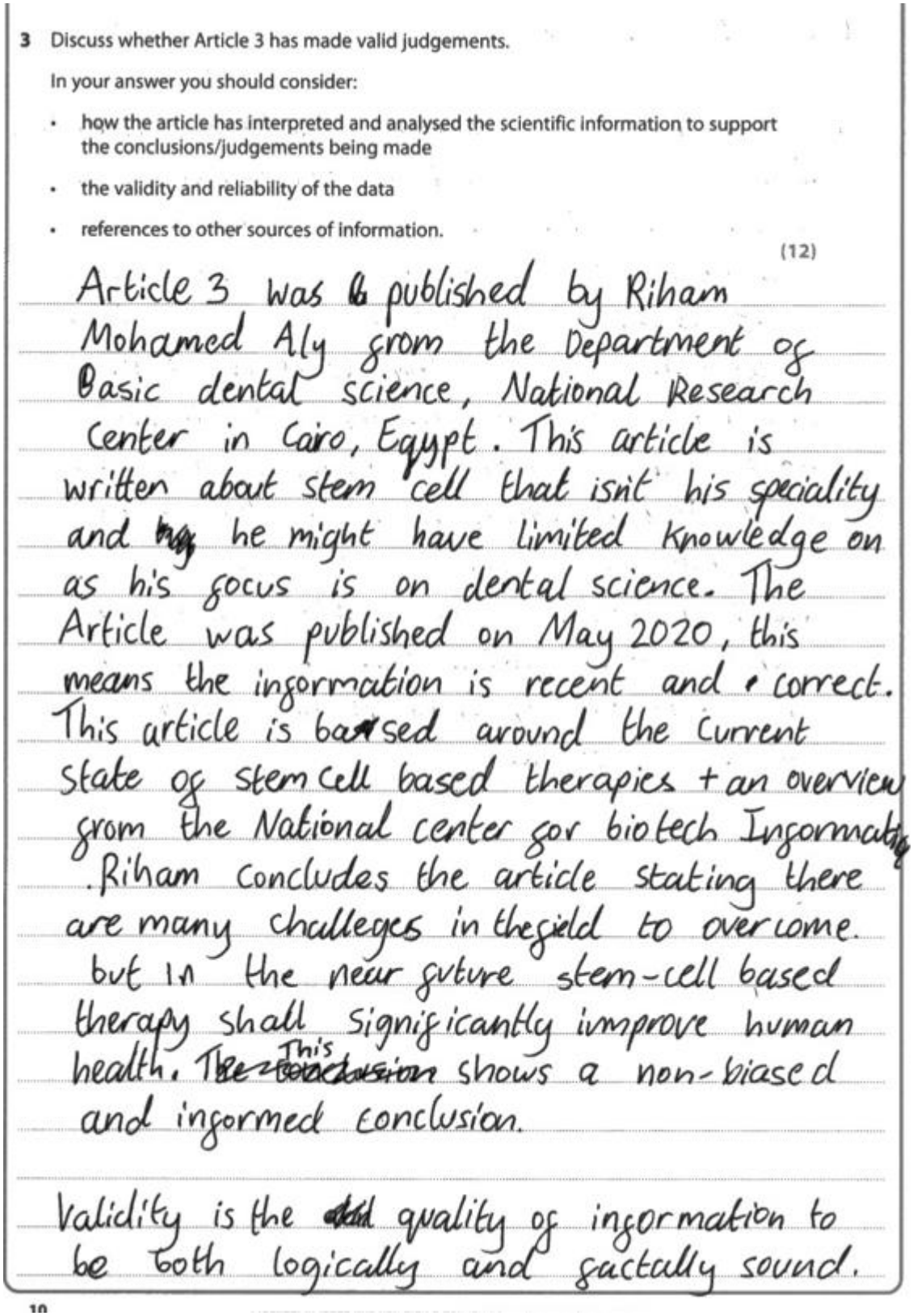
Validity = The quality at being correct or true. When something has a lot at evidence backing it up. This artical contains a lot at data relating to clinical trials and treatments that are taking place. According to various websites, Rihanns data for spinal chord injury, eye diseses, and all the other studies including the side effect are 100% correct. ~~However~~, All of this information was crossed referenced and is valid. However, Something that wasnt considered in the information on clinical trials was the sample size. For mascular degeneration, only 8% of the sample sized where documented to be correct in the clinical trial. Often 20-80 people are needed for phase 1 of a clinical trial, 100-300 in phase 2 and up to 3000 in phase 3. This means only 8% of the sample size in the clinical trials had the correct ameunt of people. If a sample size is too small accurate results cannot be obtained as there are to many factors at play to make it fair. This could therefore lead to results that are invalid and incorrect making Rihanns report ~~valid~~ potentially invalid.

In Rihans report, the information was presente in a non biased prospective. He included both positives and negatives, stating all the issues involved as well as all the positives. He states that dispite it being an amazing opportunity with potential, it does have some draw backs such as rejection, cancer, and other related issues.

All in all, Rihan's report lade out accurate information from a non biased prospective with a large number at references and everything peer reviewed. There where a couple of issues but over all the artical was reliable and valid.

Lead Examiner comment: *The response focuses on article 3 and discusses its reliability and validty with reference to some of the conclusions in the article. The discussion is well constructed and coherent.*

The following response achieved Band 2 with 6 marks



3 Discuss whether Article 3 has made valid judgements.

In your answer you should consider:

- how the article has interpreted and analysed the scientific information to support the conclusions/judgements being made
- the validity and reliability of the data
- references to other sources of information.

(12)

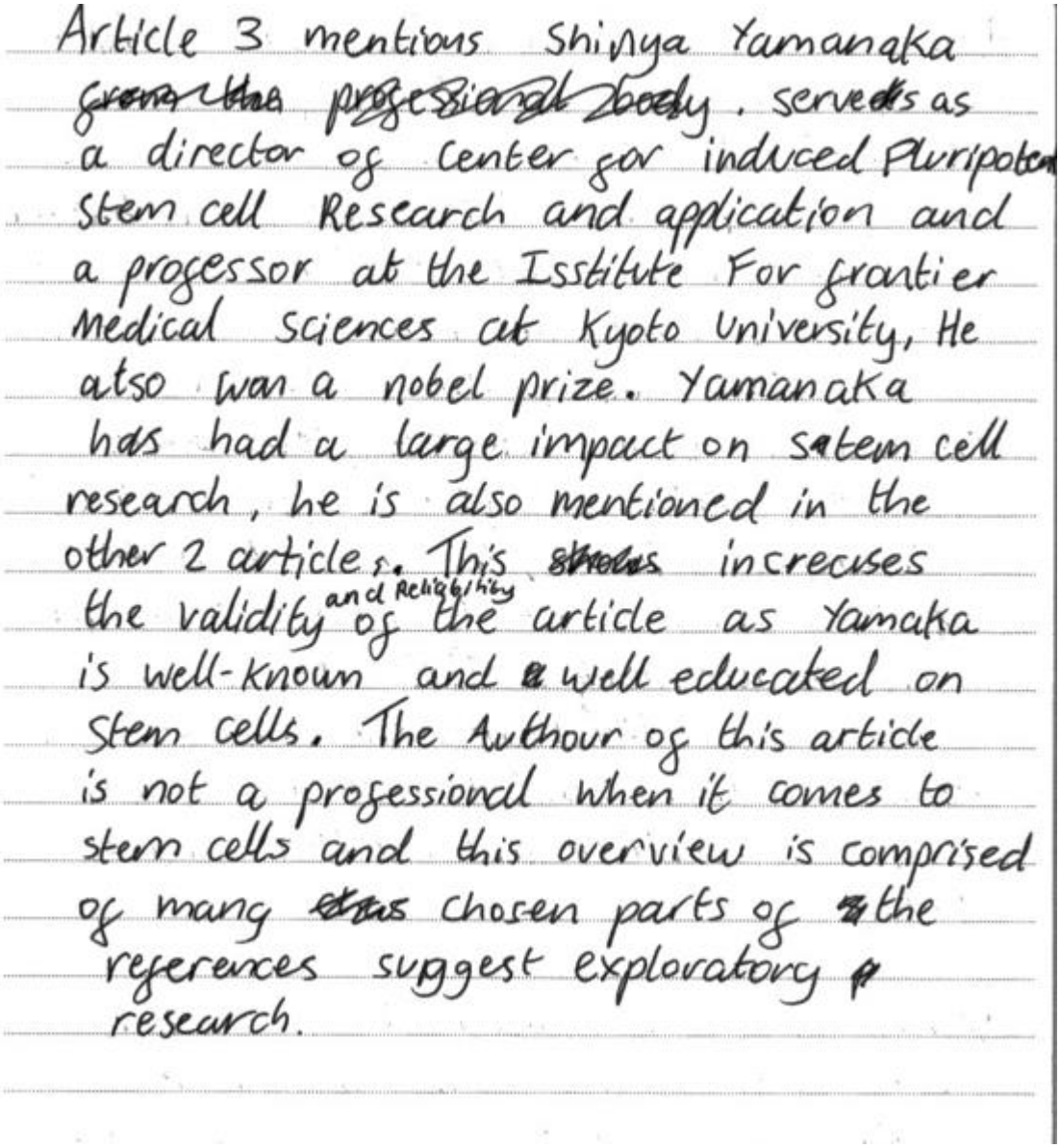
Article 3 was published by Riham Mohamed Aly grom the Department of Basic dental science, National Research Center in Cairo, Egypt. This article is written about stem cell that isnt his speciality and he might have limited knowledge on as his focus is on dental science. The Article was published on May 2020, this means the information is recent and correct. This article is based around the current state of stem cell based therapies + an overview grom the National center gor biotech Informatg. Riham concludes the article stating there are many challeges in thegield to overcome. but in the near gvture stem-cell based therapy shall significantly improve human health. This shows a non-biased and informed conclusion.

Validity is the quality of information to be both logically and gactally sound.

10

Article 3 has regerenced 62 source but the years published range from 2004 - 2020 and most of these soucces are from pubmed, this suggest the information included could be quite out of date and the range of sources is not wide. Making the validity of this research decrease. Howerer, for this article to get onto the national library of Science, more than 40 references must be peer review and the article itself. This article has also been edited and shortened so some information could be left out which makes reliability and validity hard to judge.

Article 3 is well structured as sections have subtitles and information is kept in the correct section followed by Future research and development. This is shown as he explains the success in treating degenerative sight loss and then goes on to stating that stem-cell therapies are not easy and can result in formation of a tumour.


Article 3 mentions Shinya Yamanaka ~~from the professional body~~. serves as a director of center gor induced Pluripoten stem cell Research and application and a progessor at the Isstitute For frontier Medical Sciences at Kyoto University, He atso wan a nobel prize. Yamanaka has had a large impact on satem cell research, he is also mentioned in the other 2 articles. This ~~stroles~~ increcuses the validity and Reliability of the article as Yamaka is well-known and well educated on Stem cells. The Authour of this article is not a progessional when it comes to stem cells and this overview is comprised of many ~~of~~ chosen parts of the references suggest exploratory research.

Lead Examiner comment: *The validity is discussed and partially supported by reference to the data and how the article has analysed and interpreted the scientific information. The discussion has structure and* coherence.

Q4

This question asks learners to suggest any potential areas for further development and/or research of the issue.

As this question carries only 5 marks, learners are wise not to spend too long answering it. A vague long list of areas for development and research will not score highly but a shorter list integrating relevant knowledge and ideas of how this further development would be of use will obtain a higher score.

Some learners still entirely misinterpret the focus of this question and talk about how the presentation of the articles could be improved by, for example, including more graphs and tables of data or using more paragraphs. This approach is irrelevant and not answering the question.

Many learners recognised the need for more research into unethical clinics and the risk of cancer from use of stem cells but some just reiterated research that had already been done or gave vague statements such as 'this could be improved.'

This response achieved Band 3 with 5 marks

4 Suggest potential areas for further development and/or research of the scientific issue from the three articles.

(5)

IPSCs replace the need to obtain human embryos, developing this technology farther would eliminate most ethical concerns which will increase public support and funding. A lot more research should be done ~~on~~ on ensuring the treatment are as safe as possible. Safety must be prioritised over profit in order to provide treatments to the mass population. For-profit clinics should be closely investigated so that patients feel more confident recieving treatment; regular inspections of clinics would help to keep quality and safety standards high. More regulatory guidlines need to be developed and put in place in all countries. There is currently a high chance of tumour formation during IPSC treatment, more research needs to be done to lower this possibility.

IPSCs offer many potential cures into diseases such as cancer - finding a cure to cancer would be life changing to many people and will change the face of medicine. Placing an emphasis on developing effective, safe and readily available treatments would restore

public opinion and will likely increase funding as the results of the technology is seen.

Organ transplants are often very dangerous and difficult, a healthy donor must be found and there is a possibility the organ will be regected. Many people who require a transplant are placed on a waitlist which can last several years, many people pass away while waiting for a donor. IPSCs may make it possible to grow human tissues in the lab and it may be possible to grow entire organs, more research in this area needs to take place. IPSC tech will reduce the chance of the organ being rejected and will reduce the wait time for patients.

Research should also be done on mending or regerating dead cells, some small study have proven that it may be possible. This technology could be used to treat heart attacks by activating stem cells in the heart to become new cardiac muscle cells.

Lead Examiner comment: *There are several sensible suggestions and each is discussed in a clear, logical and coherent manner.*

The following reponse achieved Band 2 with 3 marks

4 Suggest potential areas for further development and/or research of the scientific issue from the three articles.

(5)

Further research and development includes:

- More research on the effectiveness of stem cell therapy in treatment as outlined in article 3 such as obtaing proof of recovered function in spinal cord injuries after stem cell therapy. This should be done to ensure treatments are effective and clinical trials could be carried out on a larger scale on patients with spinal cord injuries or samples of cells could be taken and replicated using stem cell technology therapy to see if sensation and mobility occurs and more research could be done to help develop these trials.

-Research to discover the other unknown side effects of stem cell therapy can be done to help ensure safety and effectiveness of treatments using stem cells. Clinical trials or stimulations could be done to understand why adverse effects such as tumour formation occurs and how they could be prevented

- Developing methods to make stem cell therapy more effective and cheaper.

Lead Examiner comment: *There are two ideas here that are discussed using knowledge from the articles.*

Q5

In this question learners were asked to write an article about stem cell therapy, for a magazine aimed at teenagers who are interested in science.

It was an opprtunity for them to demonstrate creativeness as well as knowledge and understanding. Some learners wrote informative articles in the right style and tone and gave their articles a snappy title. They explained what stem cells are, how thay can be used, gave some advantages and disadvantages and reached a conclusion. Their content was carefully selected and well organised into sub sections, sometimes with side headings.

Unfortunatley some learners started well but their responses morphed into an essay in the style and tone of Q1 and some even linked points they were making to ethical, economic and social implications. Some lapsed and referred to Articles 1, 2 and 3 in their account. This was not what was required for Q5 although a brief reference to cost or how iPS cells can replace embryonic stem cells was fine.

Some learners did not leave enough time to properly tackle this question.

The following response achieved top of Band 4 with 15 marks

5 You are a trainee technician in a laboratory.

The scientists in the laboratory are carrying out research into stem cell therapy.

You have been asked to write an article for a youth science magazine about the benefits and possible risks of stem cell therapy.

Teenagers who are interested in stem cell therapy will read the article.

Use information from the three articles provided for this task.

When writing your article you should consider:

- who is likely to read the article and how you can present the information in a clear and accessible way
- what you would like the reader to learn from the article.

(15)

STEM CELL THERAPY - A NEW WAY OF LIFE.

So why Stem cell therapy?.

Stem cell therapy comes in different ways, Embryonic Stem cells and IPS cells however they both do the same job. Stem cells provide new cells for the body as you grow and replaces the old cells that are damaged or lost. Alot of research has gone into Stem cell therapies over the years, however there will always be risks, not just with the transplant itself but it could be the surgery, or your body rejects the healthy cells, they'll always be a risk, but there are many positives.

Case study: George Norton.

One case in particular was a man named George Norton who was diagnosed with acute lymphoblastic leukemia in 2005. He underwent many chemotherapy sessions and was given

the all clear. However, in 2014 george relapsed, with more rounds of chemotherapy and then a successful stem cell transplant gave him a new way of lye - CANCER FREE.

Why Stem cells? Why Now?

Currently there are 920,000 people living with heart failure in the UK. Whether its heart disease, neurological, parkinsons. Stem cells are useful for all. Stem cells can replace neurons damaged by Spinal cord injury, stroke, Alzheimers and parkinsons. Given time and resources this may be the answer to Prayers.

What are the risks?

The risks of stem cells can be mild or extreme. A few mild risks are there are no donor matches meaning that they can't find a person with identical cells as you. Another risk is the body rejecting them cells after a donor is found, which is actually quite common in stem-cell therapies. Complications from surgery is another risk. However, one main extreme risk is that one treatment using IPS cells can turn cancerous and becomes a high-risk treatment. Overall, there is no guarantee how successful these therapies will be.

Overview: Is it right for you?

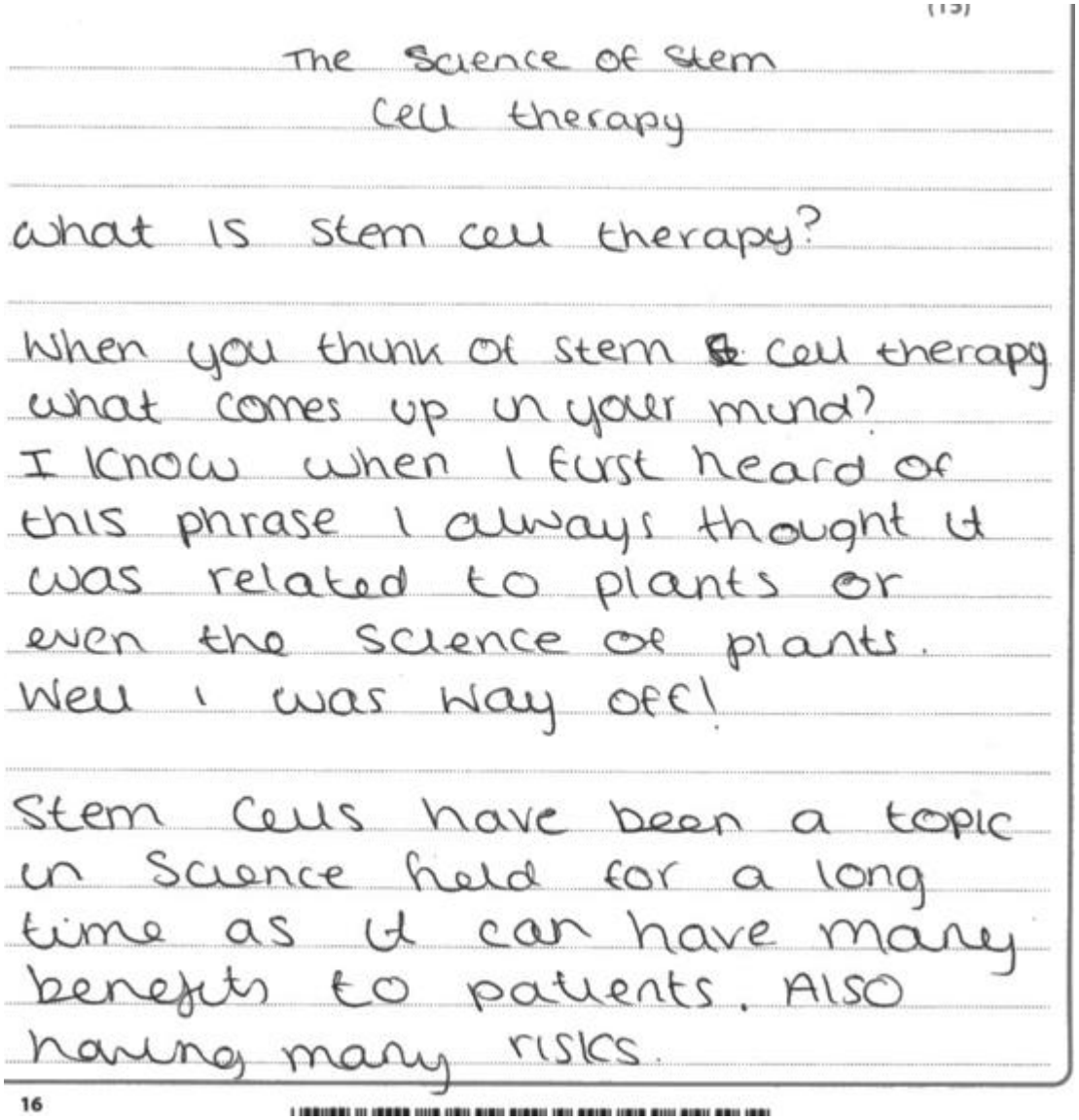
Now you know all the insights into stem cell treatment, Your probably asking yourself Is this for you? Stem cell therapy is becoming more of reality each day. This is because of the effortlessness of scientists, doctors and researchers trying to find the answers to these diseases. Currently, progress with stem cell therapies are very promising with alot of Clinical successess. No matter if your 13 or 19 you will find something that works for you, whether thats by stem cell therapy or another alternative, You never give up! There are researchers globally and one day a treatment will cure all your worries.

Conclusion:

After reading this, this may be for you, or it may not be. Whether its due to religious beliefs, or that uncertainty everybody is aloud an opinion. Currently, as your reading this researchers into IPSC's are Conquering the field of Stem cell research with lots of possibilites of treating diseases using your own cells. So if a donor cannot be matched you wont need to worry as in the future your own cells will be used. However, overall stem cell therapy holds a lot of success, from using IPS cells, to using embryonic stem cells, to successful patient stories, It's all down to you!

Lead Examiner comment: *This response is well written and includes enough information to achieve Band 4. There may be other responses that are better but that does not prevent this one achieving that level. It selects and organises relevant material to good effect for the target audience. It is informative and clear and not patronising. There is an example of the* learner's own research *included and it is clear, coherent and logical. There are some minor grammatical errors but that is not enough to bring it down to a lower mark.*

The following response achieved Band 3 with 10 marks



The Science of Stem Cell therapy

what is stem cell therapy?

When you think of stem & cell therapy what comes up in your mind? I know when I first heard of this phrase I always thought it was related to plants or even the science of plants. Well I was way off!

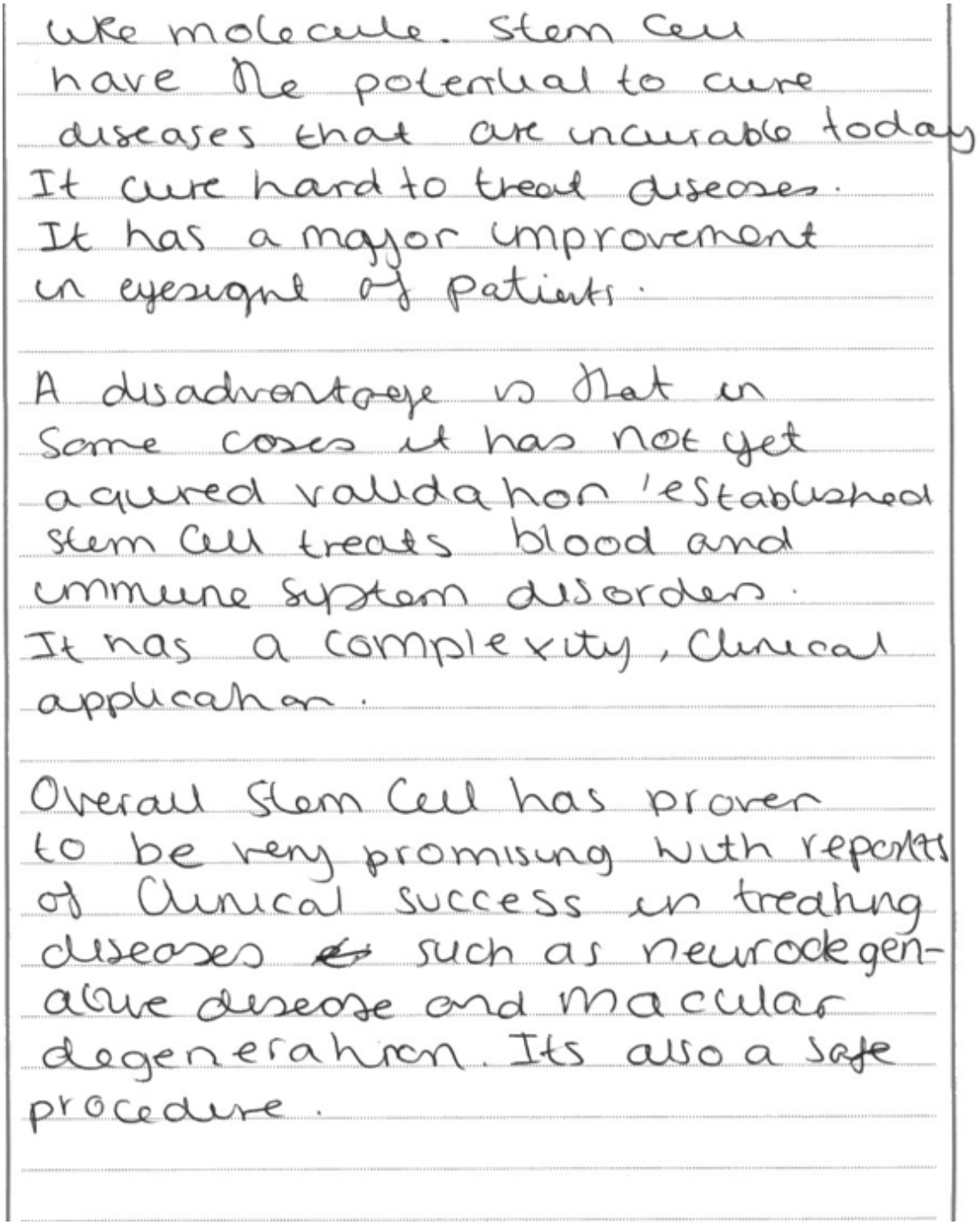
Stem cells have been a topic in science held for a long time as it can have many benefits to patients. Also having many risks.

16

Stem Cell therapy has nothing to do with the nature or the out doors as I mistakenly once thought but ~~I'm not~~ were not to blame to think like this as its in the name 'Stem Cell'. Its actually in the field of ~~A~~ Science labratories. ~~This~~ Im going to illustrate the benefits and use of stem Cell & therapy as its time to know How it has an import in the Science labratory and how its affects us.

One benefit it that Stem Cell research reveals new ways to help mend broken hearts. I know, You may think how can a Stem Cell mend an ~~entire~~ entire organ. Well proffessionals working in this new area of Stem Cells Say how life changing it will be and the impossible is now possible. ~~The~~ An advantage is that you dont need to go

through any invasive procedure to have your ~~heart~~ chest cracked open. How would you feel if Someone told you ~~they~~ they're going to crack your chest open to fix your heart? You'll have a heart attack!.
Now its made simple by taking biopsy Stem biopsy.
~~One disadvantage is that~~
Another advantage is that it cure diseases. The heat creates own stem cell becoming effective at creating new heart muscle following a heart attack. Its also advanced and ther progression into a Clinical treatment at a faster rate.
~~One disadvantage is that stem cell research is obtained~~
Stem cell research is needed to obtain human ebryonic stem cell from spare IVf fertilation. The doctor delivers it like a drug



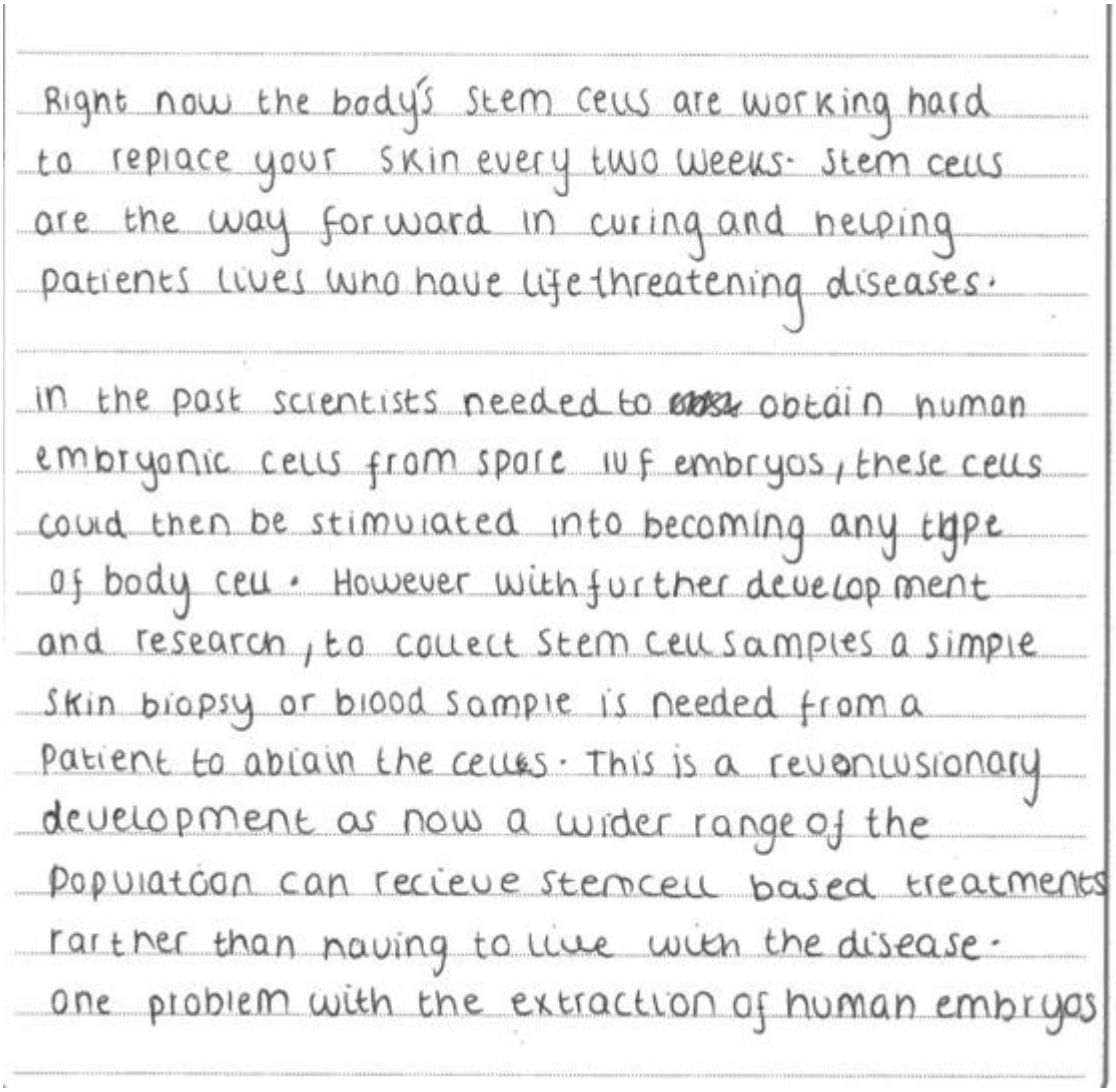
like molecule. Stem cell have the potential to cure diseases that are incurable today It cure hard to treat diseases. It has a major improvement in eyesight of patients.

A disadvantage is that in some cases it has not yet acquired validation 'established stem cell treats blood and immune system disorders. It has a complexity, Clinical application.

Overall Stem Cell has proven to be very promising with reports of Clinical success in treating diseases ~~es~~ such as neurodegenerative disease and macular degeneration. Its also a safe procedure.

Lead Examiner comment: *The learner has selected some relevant information to include but the quotes from Article 1 do not add anything or make things clearer for the intended audience. However, pros and cons are discussed and a conclusion reached.*

The following response achieved Band 2 with 7 marks



Right now the body's stem cells are working hard to replace your skin every two weeks. Stem cells are the way forward in curing and helping patients lives who have life threatening diseases.

in the past scientists needed to ~~obtain~~ obtain human embryonic cells from spare IVF embryos, these cells could then be stimulated into becoming any type of body cell. However with further development and research, to collect stem cell samples a simple skin biopsy or blood sample is needed from a patient to obtain the cells. This is a revolutionary development as now a wider range of the population can recieve stemcell based treatments rather than having to live with the disease. one problem with the extraction of human embryos

is that a wide range of the population findit morally wrong or can't participate in treatment as their religion won't allow it.

Stem cells have the potential to save many lives in the furute and to cure life threatening diseases so patients canlive longer healthier lives. Leading countries in the feild have devised guidlines for the purpose of how the new treatments are, as stem cells are a new area it makes it subject to scientific, ethical and legal controvercies that are yet to be regulated. many of the treatments are safe, however, not many of them work to cure the life threatening diseases. Also, some of the treatments are far from safe, many risks are taken when some stem-cell research is carried out. some patients suffer from complication such as infertility and neurological disabilities. This is a major risk and is very unsafe and can leave already sick patiens even sicker.

A major number of clinical trails have not yet accired fou regulatory aprovals for validations as stem cell therapies. An increasing number

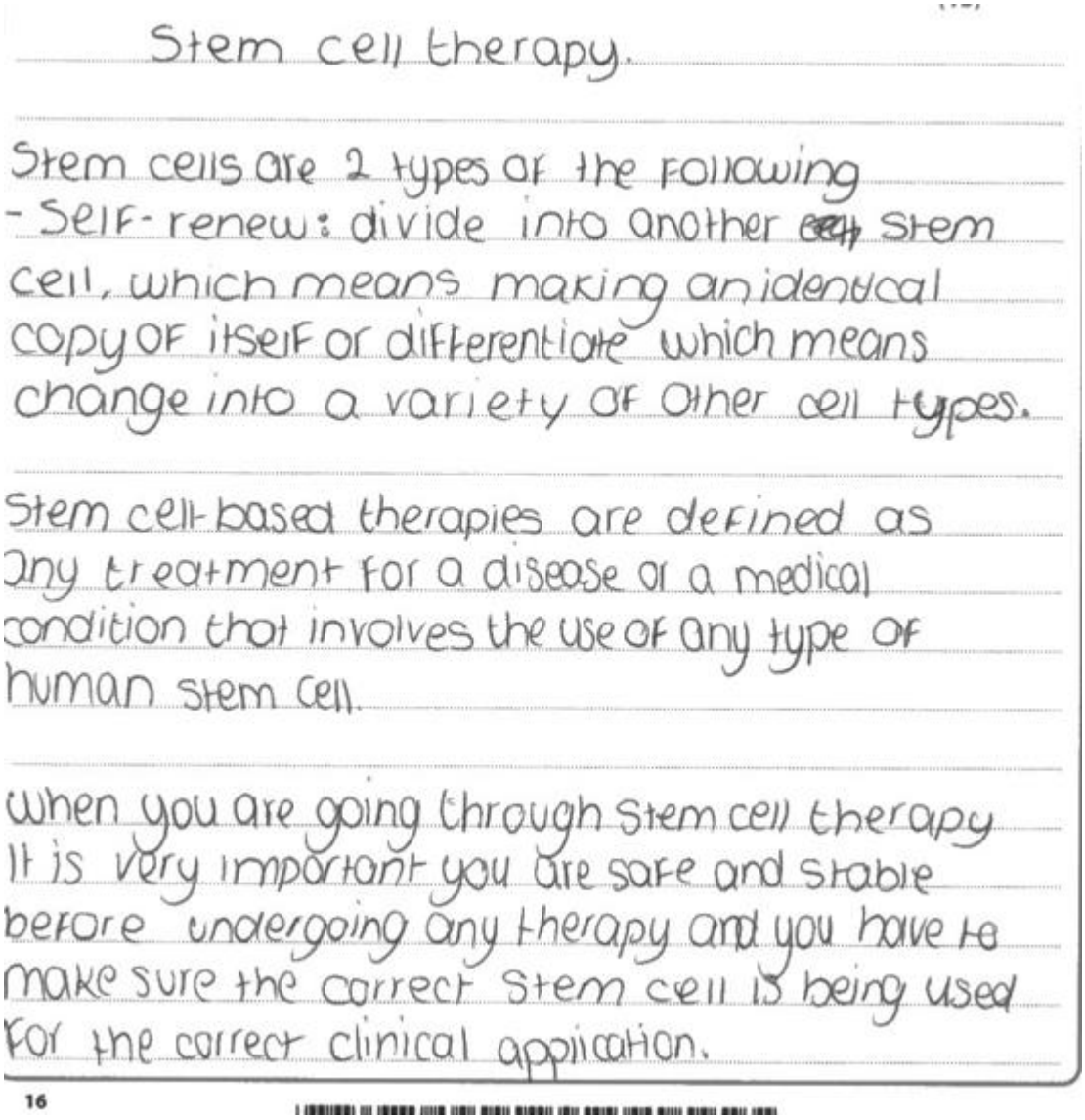
of clinics offering unproven cell based treatments, some scientists don't care about the ethical issues and don't care about the issues they could cause.

large amounts of funding are flowing into the field of stem cell research, from large companies and donations. ~~this can~~ in the future this could allow more research to be done on ~~exactly~~ how actualy stem cells could cure uncurable diseases today, rarthe than ~~for~~ only than it being safe it can ~~be~~ also cure patients too.

several companies in the sector have gone from being private to being publicly funded. this could allow more knowledge to be known ~~more~~ to the public rarther than it kept secret. This leads to the recycling of talent and capital into new companies, because the science and comertial systems have also advanced, new companies are persuing bigger challenges and driving inovation with even greater resources.

Lead Examiner comment: *This response does not really explain what stem cells are. There is some audience awareness and it selects various extracts from the articles but does not synthesise them well into an article. However, there is some coherence and structure.*

The following response achieved Band 1 with 2 marks



Stem cell therapy.

Stem cells are 2 types of the following
- Self-renew: divide into another ~~cell~~ stem cell, which means making an identical copy of itself or differentiate which means change into a variety of other cell types.

Stem cell-based therapies are defined as any treatment for a disease or a medical condition that involves the use of any type of human stem cell.

When you are going through stem cell therapy it is very important you are safe and stable before undergoing any therapy and you have to make sure the correct stem cell is being used for the correct clinical application.

16

Lead Examiner comment: *The response attempts to begin an article and a couple of points are identified but not developed or explained.*

Summary

Based on their performance in this paper learners should:

- Always read the questions carefully and make sure they are including material that is relevant and that addresses the question. This is always important but particularly so for Q5 where the scenario/type of article required will change from series to series

- Always try to synthesise the information they wish to include into a logical, coherent and clear response that is easy to follow. Try to avoid an article by article or implication by implication approach for Q1. Try to avoid just summarising the articles but use relevant information and rewrite it in their own words

- For Q3 learners should refer to conclusions made in Article 3 and avoid giving responses that are wholly generic

- For Q2 learners should suggest **how** their chosen individuals and organisations influence the issue. It is better to choose fewer examples with reference to how they influence the issue rather than a long list with no reference to how they influence

- For Q5 attention should be paid to the tone and style of the response so that it is appropriate for the intended audience as given in the question

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